Main Line Colour Light Signal User Manual

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This Manual Is To Be Read Before Commencing The Installation.

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The following .pdf files require creating to make the final User Manual, these are then joined together in Adobe Acrobat to create the issued and controlled .pdf document.

1.Pages 1-28 of this document
2.Drawing Part Number CLSH/RYGY/1P/LU
3.Page 29 of this document
4.Drawing Part Number CLSH/3RYG/1P/LU
5.Drawing Part Number CLSH/SRYG/1P/LU
6.Page 30 of this document
7.Railtrack Wiring Diagram SSI 4A (supplied by Andy Denholm)
8.Railtrack Wiring Diagram SSI 3R (supplied by Andy Denholm)
9.Railtrack Wiring Diagram RRI 4 FYY (supplied by Andy Denholm)
10.Railtrack Wiring Diagram RRI 3R (supplied by Andy Denholm)
11.Pages 31 of this document

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AMMENDMENTS

Date.	Issue.	Alterations.	DCC No.	Initials.
04/08/04	2	Document control page added. Clause 4.5 Door Reversal Instructions added. Clause 6.2.1 Rear Access cleaning instructions expanded. Clause 6.4 Text change Clause 2.4 Torque values added Clause 4.2 Text added Clause 6.2.2 Text regarding the LMT condensed Clause 7 Text expanded	2452	DR
23/08/04	3	Clause 4.4 Note added detailing a cable clamp. Clause 6.1 Note added ref lens 3 months cleaning frequency. Clause 6.2.1 Note added ref lens cleaning and optional cleaning agents.	2532	DR
21/01/05	4	Clause 2 Storage instructions inserted. All subsequent clauses renumbered to suit. Clause 5.4 Instruction to remove the temporary plug from the gland entrance added. Clause 5.1 Important Note:- ……. added. Clause 1.4 Table of Signal variants, Module variants and spares expanded to show additional options.	2669	DR
11/12/06	5	Removal of Maintenance Plans and Record Cards. Minor alterations to associated text. Clause 1.2 Network Rail Certificate PA05/2706 added. Clause 1.4 Medium Range Signal and Module variants added.	3093	DR
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1 INTRODUCTION

The Dorman Colour Light Signal System offers the user a versatile yet simple signalling product for installation in a wide variety of applications. The signal as supplied for use on Infrastructure owned by Network Rail will interface to all standard types of route relay, geographical and solid state interlocking systems as used on the main line railways in the UK. It is quickly fitted to the standard mechanical mounting arrangements that are available from all suppliers of signal posts, gantries and cantilever structures.

The modular system offers maximum flexibility in the provision of a cost effective solution to the varied requirements of major new works, renewals and maintenance installations.

The key to the simplicity of the system is the minimum number of user defined elements. These are:

- *Support Housing*
  This facilitates the Colour Light Signal Modules to be mounted on the signalling structure and aligned to the correct sighting point of the signal.

- *Colour Light Signal Module*
  The desired aspect arrangement of the signal is determined by the appropriate choice of Colour Light Signal Modules. (CLSM)

- *Backboard and Hoods*
  The Backboard gives the signal aspects a uniform black border of 300mm from the centre of aperture.
  Hoods in lengths of 300mm are standard. Other lengths are available by special request.

In addition maintenance of the signal is enhanced by the following features

- *Anti scratch lens coating*

- *Improved access*

- *True light output measurements*

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1.1 COMPLIANCES

Railway Group Standards	GK/RT0031, GK/RT0037
Network Rail	RT/E/S 10062
CE Certification	CE 89/336/EEC

1.2 APPROVALS

Unrestricted Network Rail Certificate Nos.	
Colour Light Signal Module	PA05/01515
Colour Light Signal Module (Medium range)	PA05/02706
Housing	PA05/01873

1.3 KEY SPECIFICATIONS

Operating Temperature Range	-25°C to +40°C
Operating Voltage AC	Max 121V Min 88V
Operating Voltage DC	Max 145V Min 88V
Nominal Operating Current	300 mA @ 110Vac 330 mA @ 120Vdc
Current Proving	
Relay Based Interlocking	BR941A
Solid State Interlocking (SSI)	Return Current Path 1 or 4
Light Output Intensity (all colours)	RT/E/S/10062
Light Output Colour	
Red	BS1376 Class C (Restricted)
Yellow	BS1376 Class B
Green	BS1376 Class C
Aspect Configurations	1, 2, 3 or 4
Flashing Aspects	All aspects are capable of being flashed under control of the interlocking.
Weight	
4 Aspect Signal (signal with 2 modules)	43kg
3 Aspect Signal (signal with 1 module)	33kg
3 Aspect Short Signal (signal with 1 module)	26kg

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1.4 ORDERING DETAIL

Signal Variants – Long Range

PADS No	Dorman Part No	Description
0086/009158 former NRS No 0050/001274	CLSH/RYGY/1P/LU	Dorman LED Long Range Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Left Upper Quadrant
0086/009152 former NRS No 0050/001272	CLSH/3RYG/1P/LU	Dorman LED Long Range Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Left Upper Quadrant
0086/009155	CLSH/SRYG/1P/LU	Dorman LED Long Range Short Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Left Upper Quadrant
0086/009159 Former NRS No 0050/001284	CLSH/RYGY/1P/RU	Dorman LED Long Range Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Right Upper Quadrant
0086/009153 Former NRS No 0050/001282	CLSH/3RYG/1P/RU	Dorman LED Long Range Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Right Upper Quadrant
0086/009156	CLSH/SRYG/1P/RU	Dorman LED Long Range Short Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Right Upper Quadrant
0086/009154	CLGH/3RYG/1P/BH	Dorman LED Long Range Short Ground Mounting Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Bottom Half Quadrant.
0086/009160	CLGH/RYGY/1P/BH	Dorman LED Long Range Ground Mounting Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Bottom Half Quadrant.
0086/009165	CLTH/3RYG/1P/BH	Dorman LED Long Range Short Colour Light Tunnel Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Bottom Half Quadrant.
0086/009167	CLTH/RYGY/1P/BH	Dorman LED Long Range Colour Light Tunnel Signal Head, 4 Aspect, Red Yellow green Yellow, 110V, Lamp Proved, Bottom Half Quadrant.

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Signal Variants – Medium Range

PADS No	Dorman Part No	Description
0086/009040	CLMH/RYGY/1P/LU	Dorman LED Medium Range Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Left Upper Quadrant
0086/009041	CLMH/3RYG/1P/LU	Dorman LED Medium Range Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Left Upper Quadrant
0086/009042	CLMH/SRYG/1P/LU	Dorman LED Medium Range Short Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Left Upper Quadrant
0086/009043	CLMH/RYGY/1P/RU	Dorman LED Medium Range Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Right Upper Quadrant
0086/009044	CLMH/3RYG/1P/RU	Dorman LED Medium Range Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Right Upper Quadrant
0086/009045	CLMH/SRYG/1P/RU	Dorman LED Medium Range Short Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Right Upper Quadrant
0086/009046	CLMH/3RYG/1P/BH	Dorman LED Medium Range Short Ground Mounting Colour Light Signal Head, 3 Aspect, Red Yellow Green, 110V, Lamp Proved, Bottom Half Quadrant.
0086/009047	CLMH/RYGY/1P/BH	Dorman LED Medium Range Ground Mounting Colour Light Signal Head, 4 Aspect, Red Yellow Green Yellow, 110V, Lamp Proved, Bottom Half Quadrant.

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Module Variants – Long Range

PADS No	Dorman Part No.	Description
0086/009200	CLSM/3RYG/1P/LU	Dorman LED Long Range Colour Light Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009201	CLSM/4RYG/1P/LU	Dorman LED Long Range Colour Light Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009202	CLSM/4Y--/1P/LU	Dorman LED Long Range Colour Light Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009203	CLSM/3RYG/1P/RU	Dorman LED Long Range Colour Light Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009204	CLSM/4RYG/1P/RU	Dorman LED Long Range Colour Light Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009205	CLSM/4Y--/1P/RU	Dorman LED Long Range Colour Light Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009206	CLTM/3RYG/1P/BH	Dorman LED Long Range Colour Light Ground/Tunnel Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant
0086/009207	CLTM/4RYG/1P/BH	Dorman LED Long Range Colour Light Ground/Tunnel Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant.
0086/009208	CLTM/4Y--/1P/BH	Dorman LED Long Range Colour Light Ground/Tunnel Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant.

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Module Variants – Medium Range

PADS No	Dorman Part No.	Description
0086/009170	CLMM/3RYG/1P/LU	Dorman LED Medium Range Colour Light Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009171	CLMM/4RYG/1P/LU	Dorman LED Medium Range Colour Light Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009172	CLMM/4Y--/1P/LU	Dorman LED Medium Range Colour Light Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Left Upper Quadrant
0086/009173	CLMM/3RYG/1P/RU	Dorman LED Medium Range Colour Light Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009174	CLMM/4RYG/1P/RU	Dorman LED Medium Range Colour Light Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009175	CLMM/4Y--/1P/RU	Dorman LED Medium Range Colour Light Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Right Upper Quadrant
0086/009178	CLMM/3RYG/1P/BH	Dorman LED Medium Range Colour Light Ground/Tunnel Signal Module, 3 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant
0086/009176	CLMM/4RYG/1P/BH	Dorman LED Medium Range Colour Light Ground/Tunnel Signal Module, 4 Aspect, Red Yellow Green, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant.
0086/009177	CLMM/4Y--/1P/BH	Dorman LED Medium Range Colour Light Ground/Tunnel Signal Module, 4 Aspect, Yellow, 110V ac / 120V dc, Lamp Proved, Bottom Half Quadrant.

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Spare Parts List

PADS No	Dorman Part No.	Description
0086/009220	D86.85004	4 Aspect Colour Light Signal 2 Aperture Frame Assembly
0086/009221	D86.85003	3 Aspect Colour Light Signal 1 Aperture Frame Assembly
0086/009222	D86.85010	3 Aspect Short Colour Light Signal 1 Aperture Frame Assembly
0086/009223	D86.85018	4 Aspect Colour Light Tunnel Signal 2 Aperture Frame Assembly
	B86.85019	75mm long Colour Light Signal Visor
	B20.19104	300mm long Colour Light Signal Visor
0050/001346	B86.85014	550mm long Colour Light Signal Visor
	B86.85024	550mm long ¾ round Colour Light Signal Visor
	B20.19108	4 Aspect Backboard
	B86.85007	3 Aspect Backboard
	B20.19156	Short 3 Aspect Backboard
	B20.19123	Backboard Extension
	B86.85023	Lens Blanking Cover
	D86.85052	Colour Light Signal Replacement Cover Kit
0086/009923	LMT 02	Colour Light Signal Measuring Tool
	LMT 02 RECAL	Colour Light Signal Measuring Tool Recalibration
	B16.15281	Colour Light Signal CD ROM
	C64.63267	Colour Light Signal Manual
0086/009001	D86.85087	CLS 40mm Offset Mounting Plate Assembly – for A Frame
0086/009002	D86.85056	CLS 40mm Offset Mounting Plate Assembly
0086/009003	B20.19183	CLS Lower Backboard Extension, 25mm Joggle
0086/009004	D86.85057	CLS Full Upper Backboard Extension, 25mm Joggle
0086/009005	D86.85058	CLS (Pos 3JI) Upper Backboard Extension, 25mm Joggle
0086/009006	D86.85059	CLS (Pos 6JI) Upper Backboard Extension, 25mm Joggle
0086/009007	D86.85060	CLS (Pos 3+6) Upper Backboard Extension, 25mm Joggle

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2 STORAGE

The signal modules are designed to 'breathe' through a vent situated on the bottom face of the module. This vent must be kept clear of any accumulation of standing water; failure to do this will result in water ingress into the module.

Complete signals are supplied on pallets fixed in an UPRIGHT position. This is the intended operating condition of the signals, and the breathing mechanism only operates correctly in this orientation.

DO NOT store the signals or individual modules outside in any other orientation other than UPRIGHT.

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3 SIGNAL ASSEMBLY AND ELECTRICAL CONNECTION

The numbers in parentheses in the following description refer to the part numbers as shown on drawing number CLSH/RYGY/1P/LU which is shown in Appendix D1 of this document.

3.1 Safety Requirements

In general before commencing assembly, any local safety requirements affecting the continued safe working environment of the signalling installation, either directly or indirectly should be carried out.

In particular concerning the signal, when assembly is complete, the users should note that the signal weighs 43kg. The weight of the signal may be significantly reduced to 23kg by disconnecting and removing the Colour Light Signal Modules (1, 2) prior to lift.
It is the user's responsibility to ensure that, if the signal is to be lifted then suitable certificated lifting apparatus and/or other precautions are employed.

The signal should only be assembled both mechanically and electrically, by staff deemed competent in these fields by their employer.
It is the user's responsibility to ensure that the signal is installed and/or maintained by certificated and competent staff.
There are no specific competencies required for the signal.

Independent national competence accreditation schemes are in use in the UK.
For further details of such a scheme, the information is available from the
Institute of Railway Signalling Engineers.

3.2 Tooling

Tools used in the assembly of the signal (except for lifting etc) need only be limited to hand operated types. A typical tooling requirement required would be:
Socket set comprising lever and 2BA, 7mmAF, 8mmAF, 10mmAF 17mmAF, and 30mmAF sockets.
Open ended spanners 30mmAF, 17mmAF (for signal alignment)
Calibrated Torque wrench with a maximum of 40 Nm setting.
Calibrated Crimping tool (PIDG compatible)
Allen Keys 2.5mmAF, 3mmAF and 4mmAF (for removal of visors, backboard and changing hinge opening side)
Pozi drive screw driver
Wire Cutters, Wire strippers, Padlock Key for RKB221 lock
Light Measuring Tool (Part no's to be advised)

3.3 Recommended Sundry Items

It is recommended that a supply of 2BA nuts, plain washers, sliding links and 2BA PIDG Ring Crimps are available to the installation staff.

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3.4 Housing Assembly and Mechanical Adjustment

The complete four aspect signal is comprised of two cast Colour Light Signal Modules (CLSM) (1, 2), door (3), two-aperture frame (5), two-aperture backboard (6), backboard extension (8), mounting plate (9), and two visors (7).

The two-aperture frame (5) and the mounting plate (9) are always factory assembled together. The other listed parts may require mounting onto the aluminium fabrication (5) and adjustment as required for signal sighting purposes etc.

Lifting of the complete signal into position onto the support structure is achieved by use of the two M16 lifting eyes located near to the top on either side of the aluminium frame (5). These may be removed after installation of the signal.

Fixing of the signal to the support structure is by the use of four M20 bolts through the Mounting Plate (9) into locking or prevailing torque nuts underneath the platform (not shown).
Note the M20 nuts, washers and bolts are customer provided to match supporting structure requirements.

In order to sight the signal at the correct distance from the signal, the two aperture frame (5) is capable of forward and backward tilt adjustment about the pivot shaft that is located on the mounting plate (9) by $\pm 4^{\circ}$. It is fixed into position by tightening to a torque setting of 40 Nm, the Vertical Tilt Adjustment Clamp Bolts located on both sides of the mounting plate (9).

Rotational adjustment of the signal by $\pm 6^{\circ}$ is facilitated by the 22mm slotted mounting holes machined into the mounting plate (9). This allows signal sighting to be set at the correct angle relative to the track.

To allow the correct sighting point to be used to align the signal, a Sighting Scope is affixed to the aluminium enclosure (1). This will allow the user to see the sighting point via a magnified image. A circular etched ring on the sighting scope will allow the user to align the signal accurately.

The door (3) is mounted on hinges either at the rear left or the rear right of the aluminium fabrication (5). The door is normally factory set to open to the left, but the hinges and the stay may be moved to allow the door to open to the right by the user if desired.
The hinges are fixed to the aluminium frame (5) by two M5 socket headed machine screws and nuts. The door is held to rear of the two-aperture frame (5), by the use of a handle fitted bolt, that may be secured by an RKB221 Padlock, which is to be supplied by the customer.

The backboard (6) is secured to the front of the two-aperture frame (5) by the use of six M5 socket headed countersunk screws. The backboard extension (8) is affixed to the backboard (6) by the use of a further four M5 socket headed countersunk screws into captive nuts. (Torque: 1.5 Nm)

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The visors (7) are affixed to the two-aperture frame (5) by the use of four M5 socket headed countersunk screws. (Torque: 1.5 Nm)

3.5 Colour Light Signal Module Assembly and mechanical adjustment

The Colour Light Signal Module (1) is located into the two-aperture frame (5) by use of the pivot shaft at the bottom of the mounting plate (9). It is held in place by use of a spring loaded latch assembly at it's top, which clips over a similar mounting shaft and is secured by a RKB221 Padlock which is supplied by the customer.
The Colour Light Signal Module (2) is similarly mounted and secured onto the two-aperture frame (5) by use of shafts, latch and RKB221 Padlock.

3.6 Electrical Connections

Electrical inter-connection of the Colour Light Signal Modules (1 and 2) is completed by connecting the plug from (2) into the socket mounted on (1).

Access to the terminals to allow wiring of the signal to the signalling circuitry is effected by removal of the four captive M5 Pozi countersunk screws on Colour Light Signal Module (1) only. This will allow the lid of the terminal box to be removed. There is no user access at the rear of Colour Light Signal Module (2), which is similar in appearance to Colour Light Signal Module (1).

Within the terminal box, 2BA stud blocks are provided. PIDG ring crimps on each conductor locked down by 2BA nuts should be used in order to connect the tail cable to the stud block.
Temporary disconnection of each circuit may be achieved by use of sliding 2BA links.
A typical wiring diagram is provided in Appendix W1 of this document.

Please note the signal is supplied with wire links between terminals 2,4, 6 and 8. The relevant wire links should be removed when the signal is connected to SSI.

Full signalling wiring diagrams will be provided by the design office responsible for the installation.

When wiring is completed the lid of the terminal box is re-fixed using the four M5 Pozi countersunk screws.

Prior to bringing the signal into use, an overall black bag with a superimposed white cross may be secured temporarily around the back of the signal door.

3.7 Three Aspect Signal

A three aspect signal is similar in construction, assembly and connection, but has a one-aperture backboard and only 1 visor.
Drawing number CLSH/3RYG/1P/LU for this version is given in Appendix D2

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4 DESIGN

The signal has been designed to ensure that the design, installation, commissioning and maintenance any new signalling scheme or retrofit renewal is as effective as possible. There are minimal differences in its use, compared with traditional forms of signal that are easily encompassed by existing standards and specifications.

4.1 Mechanical

The signal has been designed to fit the standard mounting arrangements using M20 bolts and are shown for reference on the drawing given in Appendix D1

If in addition to the main signal head, the signal installation requires a Position Light Junction Indicator, Position Light Signal, or any alphanumeric indicator then the standard support frames as shown in the BRS SE series of drawings or other approved methods are to be used. Designers are reminded that the two-aperture frame is not designed to support any other signalling equipment.

4.2 Signal sighting

Information regarding the physical dimensions of the signal in order to assist the design staff preparing standard sighting forms to GK/RT 0037 are given on Diagram CLSH/RYGY/1P/LU.

It should be noted that as there is no "hot strip" present on the signal lenses, the signal will be ordered as a handed item. A left handed signal is one which is mounted to the left of the centreline of the track and conversely a right handed signal is one that is one to the right of the centreline of the track. Left hand and right handed CLSMs are mounted on the same aluminium frame but user configuration of the CLSM is not possible.

Design staff and staff competent to sight signals should be aware are that there are no special provisions regarding the use of the signal.

4.3 Maintenance

One of the key maintenance features of the signal is that of its ability to be cleaned from the rear. It is therefore of particular interest to design staff and staff competent to sight signals, that the use of larger sighting boards other than the standard 1100mm x 600mm (supplied with the signal) may be used in order to further improve conspicuity against light cluttered backgrounds. E.g. Urban areas.

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4.4 Electrical

4.4.1 General

The signal will interface with existing relay based or Solid State Interlocking (SSI) that is in use within the UK. It should be noted that due to the high reliability of the signal, no filament checking relay (EKR) is provided, although terminals 9-12 are provided for the termination of the appropriate cable cores in retro-fit applications.
The signal is supplied complete with all removable components provided with earth bonding straps. No special design is required in this respect.

4.4.2 Lamp Proving and Power Supplies

The signal is designed to interface to a standard lamp proving relay to specification BR941A, or Current Proving Paths 1 or 4 for SSI. It is recommended that these standard components are used in conjunction with the signal for new installations. For use of the signal with other current proving arrangements then advice should be sought from Dorman.

The nominal operating voltage is 110Vac, with a typical power consumption of 30W per aspect. The signal will maintain its light output between voltage variations as defined in RT/E/S 10062. (Typically 88V-121Vac.)
For further information for use on poorly regulated power supplies then advice should be sought from Dorman.

4.4.3 Flashing Aspects

There are no special requirements in order to provide flashing aspects on relay based interlockings. When using the signal on Solid State Interlocking Trackside Functional Modules (TFMs), the ballast resistor that otherwise has to be provided for conventional signal heads to maintain energisation of the Lamp Proving Relay (ECR) during the dim phase of the flash should be removed. However due to the design of the SSI system itself, it is not possible to use the resulting free outputs.

4.4.4 Circuits

Typical circuits that may be employed are given in Appendix D3

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5 INSTALLATION

When installing the signal on Network Rail, the installation standards of the signal should follow the general provisions of the Signalling Installation Handbook.
This publication is available from Network Rail.
In general terms, the installation of the signal will take place during engineering possessions of the working railway, and structures used to support the signal and other items of equipment will be designed in accordance with prevailing legislation and standards and are outside the scope of this information booklet.

5.1 Mechanical

The order of installation is not predefined by the design of the signal. It may be lifted as a complete mechanical unit or may be taken in its constituent parts to a signal gantry or cantilever and then assembled as described above.
When installing the signal, remove the backboard extension and refit the fixing screws to the main backboard (to blank off the fixing holes). If required, fit the backboard extension to the bottom of the main backboard using the 4 screws already in place.
However care should be taken with the backboard extension piece to avoid it being damaged if lifting a completely dressed signal, as this component protrudes below the lower edge of the two-aperture frame.

Important Note:- All warning labels must be removed from the front face of the signal during installation.

The signal is affixed to the support structure by means of 4 x M20 bolts washers and nuts as defined by the design engineer and provided by the customer. In order to install these bolts it is recommended to remove the lower CLSM. Once installed, initial tightening of these bolts should be sufficient to secure the signal to the structure.

When removing the CLSMs from the frame, do not place the units facing downwards onto any surface that could scratch the outer lens. Never leave the units with the lens facing the mid day sun as the lens is capable of concentrating the light energy enough to damage the LEDs with the build up of heat, cover the units.

Mounting of the CLSMs to the frame is as follows.
The lower front edge of the CLSM is placed over the pivot shaft and the CLSM is then rotated forwards over the shaft and secured by the spring loaded latch on its top engaging onto a similar shaft in one movement. A padlock is then used to prevent unauthorised access.

Visors are fitted to the backboard.

Prior to bring the signal into use, an overall black bag with a superimposed front facing white cross may be secured temporarily around the signal.

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5.2 Signal Alignment

The signal is supplied complete with a signal alignment scope that is fixed on the top of the lower Colour Light Signal Module. This module will have to be mounted on to the support frame in order to align the signal.
When looking through the scope the user will note that the observed view is magnified. (Ensure front and rear scope lenses are clean)
Etched onto the lens of the scope is circle that is calibrated for 3°. When using the scope, adjustment of the M20 bolts and tilting of the two-aperture frame about the pivot shaft will allow accurate alignment of the signal to be set. When the desired alignment setting is reached, final tightening of the M20 bolts and the vertical tilt adjustment clamp bolts can be undertaken.
These latter bolts should be tightened to 40Nm.
Note: The torque setting for the M20 bolts should be given by the design engineer.

5.3 Earth Continuity Bonding

The Colour Light Signal Modules and rear door once mounted and secured should be bonded to the frame by use of the earth bonding straps. These are fitted to the components and the frame by M5 hex headed screws. They should be tightened to a torque setting of 1.5Nm
The front backboard, backboard extension piece, and visors are deemed to be bonded by virtue of their correctly installed permanent fixings.
Bonding of the signal to the structure is deemed to be effective by the M20 fixing bolts.
If the customer requires additional bonding points they are available on the bottom of the aluminium frame.

5.4 Electrical Connections

Electrical inter-connection of the two CLSM is completed by connecting the plug from the upper CLSM into the socket mounted on the lower CLSM

Access to the terminals to allow wiring of the signal to the signalling circuitry is effected by removal of the four captive M5 Pozi countersunk screws in the rear cover on the lower CLSM only. This will allow the lid of the terminal box to be removed. There is no user access at the rear of the upper CLSM, which is similar in appearance to lower CLSM.

Within the terminal box, standard 2BA stud blocks are provided. Each link is labelled 1 to 12 from left to right as seen from the rear. PIDG ring crimps on each conductor locked down by 2BA nuts should be used in order to connect the tail cable to the stud block.

Temporary disconnection of each circuit may be achieved by use of sliding 2BA links.

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The tail cable to the signal is routed to the terminal blocks through a gland at the bottom of the lower CLSM. It will be necessary to remove the temporary sealing plug from the gland entrance to allow cable entry. When tightened this gland will support the cable and complete the sealing of the enclosure without need for further accessories.
However a clamp is provided to be fitted around the feed cable which will prevent the cable from falling back through the cable entry hole at the base of the signal housing if/when a module is removed.

Full signalling wiring diagrams will be provided by the design office responsible for the installation.

When wiring is completed the lid of the terminal box is re-fixed using the four M5 Pozi countersunk screws.

5.5 Door Reversal Instructions

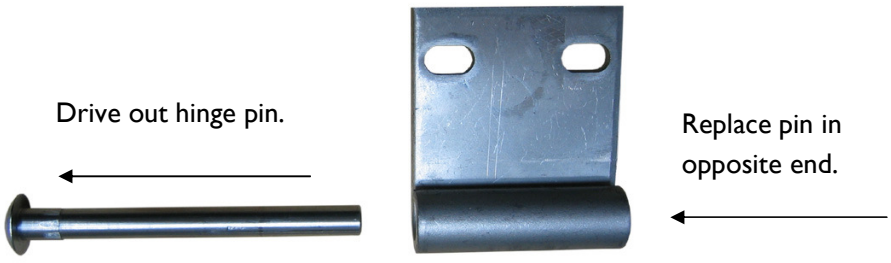
Note the assembly order of any fasteners removed in the instructions below, to ensure correct re-assembly sequence.

The illustration entitled "View On Rear Of Signal Frame Assembly" shows the positions of the components referred to in the following paragraphs.

Undo the two dome nuts (a) securing the door stay bracket to the door. Undo the two button head screws (b) securing the frame stay bracket to the frame. Remove the stay assembly (c) as one complete unit. Do not dismantle the stay assembly into its component parts.
Lift the door off its hinges.

Door Alterations.

1. Remove the 4-off rubber doorstops (d).
2. Remove the 2-off door hinges (e). Drive out the hinge pins and replace in the opposite end of the door hinges.



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3. Replace the hinges on the opposite side of the door. Do not tighten at this stage to allow later door / frame alignment.
4. Replace the rubber door stops on the opposite clinch studs.
5. Remove the 2-off earth straps (f) from the base of the door and replace on the opposite side of the door.

Frame Alterations.

1. Remove the frame earth strap (g) and replace on the opposite side of the frame.
2. Remove the 2-off frame hinges (h). Drive out the end caps and replace in the opposite end of the frame hinges.
3. Replace the hinges on the opposite side of the frame. Do not tighten at this stage to allow later door / frame alignment.

Remount the door onto the frame. Adjust the hinges for satisfactory door operation. Note – Set the door to give 1mm clearance between the inner face of the door and the top of the rolled edge on the frame. Tighten all hinge fasteners.

Turn the stay over and refit to opposite side.

Stay position on RH hinged door.

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View On Rear Of Signal Frame Assembly

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6 NEW WORKS TESTING

New Works Testing of the signal is undertaken using the standards laid down by the customer. Typically on Network Rail infrastructure this will be to the provisions of the Signal Testing Handbook. Copies of this document are available from Network Rail.

It is the responsibility of the Testing Engineer to provide all necessary documentation pertaining to the testing of the signal. There are a number of features of the Dorman signal which require testing in a different manner to that of a filament lamp signal. These should be taken into account when preparing any specification for new works testing.

Parameter	**Difference to filament signal**
Signal Alignment.	Alignment scope is used.
Signal Head Voltage.	In terminal box on links.
Light Output	Over CLSM lens by use of Light Measuring Tool (LMT). Acceptable light output is >60% of the original manufacturers setting as indicated on the rear of the CLSM.
Hot Strips	No hot strips are provided. The correct handed signal should be installed.
Correct CLSMs	Correct modules are installed to give aspect arrangement on signal sighting form
Wire Count.	Only user terminal wiring may be checked. A Certificate of Conformity is provided in each signal head.
Filament Proving	No filament proving is provided.

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7 MAINTENANCE

7.1 Preventative Activities

The signal has been designed to reduce maintenance activities to a minimum.
The signal is to be maintained in accordance with Network Rail Signalling Maintenance Specifications.
Copies of this document are available from Network Rail, 40 Melton Street London NW1 2EE

In planning a maintenance regime for the signal, it is up to the user to specify the frequency of application of the services contained within the SMS. Due to the high reliability of the signal, the signal requires fewer routine maintenance activities. It is suggested that these could be at a minimum frequency of 6 months but 3 months for lens cleaning , see para 6.2.1.

7.2 Notes on Access and cleaning activities.

One novel feature of the signal is its access arrangements for maintenance activities.
The signal may be cleaned or its light output measured from the front in a similar manner to a conventional filament lamp signal. However when mounted on elevated or over line support structures, the design of the signal is such that access from the rear may offer a safer working option for maintenance personnel.

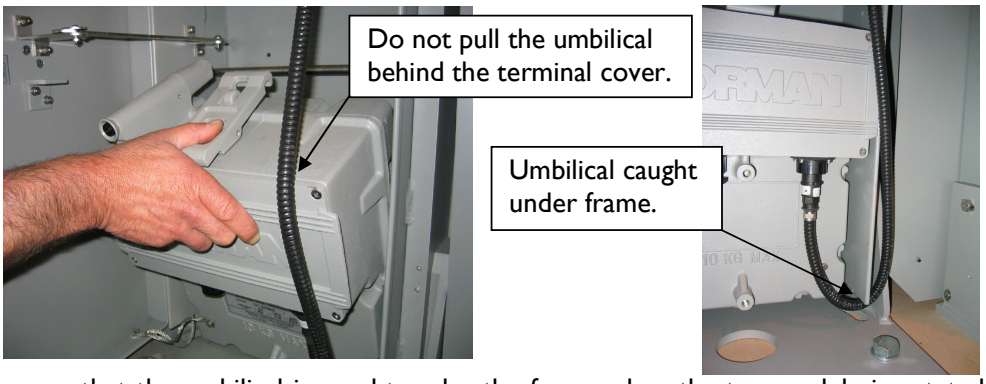
It is necessary for the appropriate safety arrangements to be applied to protect the working railway:

- in order to access the signal from the rear,
- when carrying out light output measurements.

7.2.1 Rear Access

Rear access to the CLSM lens is as follows.

- remove the padlock securing the CLSM
- unclip the CLSM latch and rotate the CLSM backwards about the (lower) pivot shaft until clear of the aluminium frame. Note: take care that the umbilical is not pulled behind the terminal box cover as the lower module is rotated backwards



or that the umbilical is caught under the frame when the top module is rotated to lock back in its working position.

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- Cleaning or light measurement can now be undertaken. To preserve the performance of the signal, the maintainer shall ensure that the module lenses are regularly checked and cleaned in accordance with RT/SMS/SG11. This should be at a minimum of every 3 months using an appropriate cleaner.
  Suitable cleaning agents for the module lenses are; Speedclean 21, Grimeshifter, DCI or Spraid.

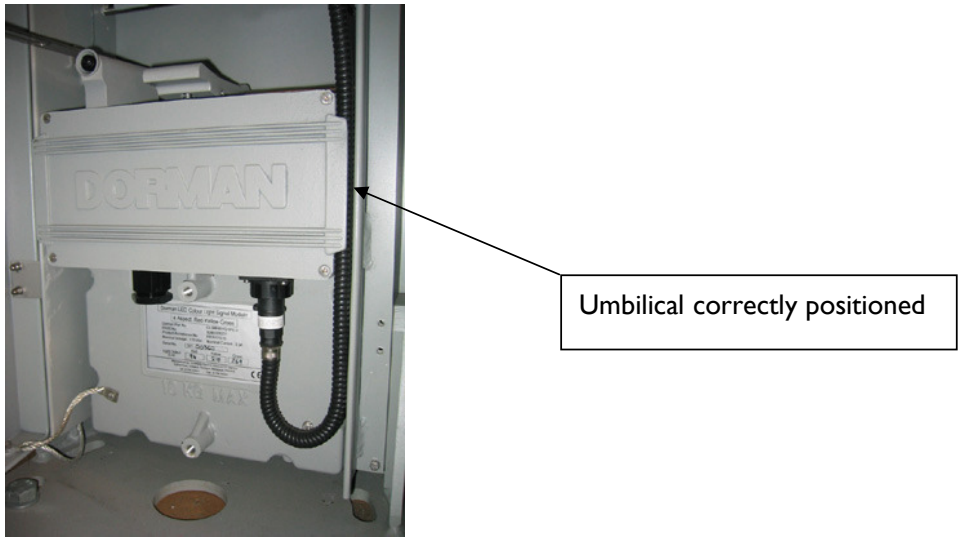
  Note that it is the responsibility of the maintainer to establish and employ the relevant health and safety precautions when using the cleaners above.

Cleaning of the module lens.

At this stage:

- Clean the telescope lenses
- Check the sighting hole in the backboard is clear of any obstructions.

Replacement of the CLSM is the reverse of the above steps, taking care to ensure that the CLSM latch is properly engaged and the umbilical is correctly positioned between the 'wing' of the terminal cover and the side of the frame.



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7.2.2 Light Measurement

A light measuring tool (LMT) is available to measure the light output of the CLS at various intervals in its life span.
Records of such tests should be entered on an approved record card.
Full details of the LMT and its operation are contained within Dorman document supplied with the LMT

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7.3 Maintenance Changing and Testing Activities

The signal has been designed to allow maintenance changes to be effected in accordance with existing Network Rail Instructions. The appropriate document for this activity is the Signalling Maintenance Testing Handbook (SMTH)
Copies of this document are available from Network Rail, 40 Melton Street London NW1 2EE

Should a maintenance change of signal head be required then a suggested SMTH test plan is given in Appendix M1.

Note that on signals equipped with flashing aspects, then the provisions of the test plan exclude the use of SMTH in the first instance to change the head from a conventional filament lamp signal. This is because the associated ballast resistor(s) (mounted externally in the case of SSI and within the BR901 flasher in the case of RRI installations) will need to be disconnected and the associated wiring secured out of use as necessary. However the test plan is suitable for use as the basis of a method statement that could be prepared by competent staff in order for the signal to be changed in the signal maintenance environment.

7.4 Fault Finding

Faulting staff should be made aware that as the filament failure indication function is not provided there are slight differences in the symptoms of possible failures of the signal.
If the signal detects that the light output from the LED array is not illuminated, partly illuminated or that the umbilical cable is not connected or damaged, the lamp proving function associated with the signal to be "not proved". This will result typically in the ECR relay de energising or the Current Proving Bit on an SSI interlocking to be removed from the reply telegram.
As in some installations the filament proving circuit (that is provided for other signals that require it) will remain energised in this failed state.

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8 RECOVERY AND RESERVICING

The signal modules and the housing are designed to be as environmentally friendly as possible.

The front lens may be changed by the user and this is carried out as follows.
Remove the six M4 socket headed countersunk screws from the outer lens clamp ring in the front of the CLSM. Remove the defective lens and associated attached gaskets.
Fit new outer lens with fitted gaskets, spacers, clamp ring and screws. It is important that the six clamp ring screws are progressively / evenly tightened down to compress the gaskets until the clamp ring flange lightly contacts the signal module casting. Take care not to over tighten the screws beyond this point as this will result in deformation of the clamp ring and possible seal failure.

All other re-servicing and refurbishing activity must be carried out by Dorman or its nominated authorised servicing agents.

The two-aperture frame and its component parts may be dismantled and recycled.

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APPENDIX D1
Two Aperture General Arrangement

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APPENDIX D2
Single Aperture General Arrangements

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APPENDIX D3
Typical Wiring

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APPENDIX M1
Suggested SMTH Test Plan

Includes: **Replacement of Position Light Signal Heads to BRS-SE 160 with Dorman Type LED Modules.**

Replacement of Main Signals to BR 903 with Dorman Type LED Modules

Replacement of all PLJI, and Route Indicator Signals with Dorman Type LED Modules.

Replace a Signal fitted with LED Modules

Excludes: **Replacement of Main Signals to BR 903 with Flashing aspects with Dorman Type LED Modules**

All other types of Signals

NOTE: **Position Light Signals may be ground mounted or elevated.**

Definitions: Light Emitting Diode (LED)

BEFORE INSTALLATION WORK

1 *Check* replacement signal head or module is *not damaged* and is *correct* type.

2 *Check* replacement signal head internal wiring corresponds to the internal wiring of the existing signal head or revised installation drawing.

3 *WIRE COUNT* existing signal head to the wiring diagram

4 *Check* existing wiring has *safe insulation.*

5 *INSULATION TEST* replacement signal head (Minimum 2 MΩ terminals to case).

6 *Check* existing wiring is *correctly labelled*

7 *Check* existing signal head is isolated from the supply.

AFTER INSTALLATION WORK

8 *Check* replacement signal head or module is *correctly installed*

9 *Check* LED modules are correct type and colour and are correctly orientated for their application.

10 *Check* that hoods are *correctly installed* and are *correct type*.

11 *Check* wiring is replaced as labelled

12 *WIRE COUNT* replacement head to the *wiring diagram* or revised installation drawing

13 *Check* any links and red dome nuts are correctly replaced and secure.

14 *Check* terminations are secure and suitably protected.

15 *Check* cable entry is secured and the signal head wiring is not liable to mechanical damage.

16 *EARTH TEST* circuits if designed to be earth free.

17 *Test* each LED module [Signal Lamp Test (SMS)]

18 *Check* for correct beam alignment [Beam alignment (SMS)]

19 *ASPECT TEST* signal

20 *Check*, or arrange for, *correct labelling* of the unit.

21 *Check* signal head door fits correctly (Door seal intact, no case damage)

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